SpectrumFi, Inc.

December 5, 2016

The Honorable Tom Wheeler, Chairman
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Subject: Regarding Initiating Collaborative Efforts for the Development of the Next-generation Spectrum sharing Ecosystem

[A short summary of the comments]

To meet the increasing demand for the spectrum-resource, FCC has been promoting shared use of the spectrum-resource. In this letter, we provide a few suggestions on enhancing spectrum sharing and request an collaborative forum towards defining the next-generation spectrum sharing ecosystem. The collaborative forum could include regulators, policymakers, commercial and defense technology industry, spectrum owners, spectrum providers, and service-providers. The team could discuss issues, formulate requirements for the next generation spectrum sharing architecture, and develop candidate approaches. It would be helpful to have a playground-environment and an agile process to make enhancements to spectrum sharing policy and technology.

Below we provide extended comments.

[Extended Comments]

CURRENT-GENERATION SPECTRUM SHARING

FCC has been investigating dynamic spectrum sharing paradigm to make an efficient use of the spectrum and meet the growing demand for spectrum.

We make following observations regarding the current generation spectrum sharing

- The spectrum sharing approach is feasible in only specific locations and conditions.
- The spectrum sharing approach involves several conservative assumptions to handle the worst-case conditions.
- The spectrum sharing approach does not recover fine-grained spectrum-access opportunities in the space, time, and frequency dimensions.
- The spectrum sharing approach is not automated.
- The pool of shared spectrum is very much limited as the spectrum-owners are often unwilling to share spectrum.

These are a few high-level observations that affect the business potential. From the service-provider's business perspective, it is essential to accomplish cost, coverage, performance, and reliability to provide satisfying quality of experience to their customers.

We suggest to initiate an effort to overcome the limitations of current generation spectrum sharing ecosystem.

NEXT-GENERATION SPECTRUM SHARING ECOSYSTEM

We outline a few desirable attributes for the next-generation spectrum sharing ecosystem.

- The spectrum sharing approach (includes policy and technology) should be able to recover a large amount of spectrum to facilitate real-time dense spectrum sharing.
- The spectrum sharing approach should be attractive for spectrum-resource-producers and spectrum-resource-consumers. This will help to build a large pool of spectrum and would make several new business models feasible.
- The spectrum sharing approach should be simple, flexible, and efficient.
- The spectrum sharing arrangements need to more open and inclusive.
- Spectrum sharing policy and in the overall ecosystem should be agile to quickly incorporate experimentation outcomes.

- An efficient spectrum-sharing ecosystem would likely require detailed knowledge of the RF-environment. Therefore, privacy will be a key element of the next generation spectrum sharing ecosystem.

COLLABORATION WITH AN AGILE PROCESS

We suggest to setup an open collaboration forum to define the next-generation spectrum sharing ecosystem. The forum would have spectrum-owners, service-poroviders, spectrum-brokers, policy-makers, technology-owners, and regulators.

To make the forum more open and inclusive, we suggest to have a competition-framework. Potential members for each type of the role may make proposals towards the next-generation spectrum sharing ecosystem. A fixed number of participants could be shortlisted based on the merits of their proposals.

An essential element of the collaborative forum would be support from FCC and NTIA.

We suggest to adopt an agile process for developing the next-generation spectrum sharing ecosystem. To facilitate the agile process, we suggest to provide an open playground would be highly useful wherein spectrum sharing technology and policy could be experimented.

Spectrum sharing policies are going to play more and more crucial role in the following years. In order to evolve the spectrum sharing policy, we suggest to embody a living experimentation framework into the ecosystem that can quickly bring in performance improvements while ensuring openness and fairness.

The system is likely going to perform better with growing fine-grained spectrum-data and evolving spectrum-technology (for example, the feasibility of lower cost high quality agile transceivers). To this end, the collaborative forum should include short/long time-line programs to enhance the spectrum sharing technology and policy.

PLAYGROUND FOR SPECTRUM SHARING TECHNOLOGY AND POLICY

Here, we make the case for a playground environment considering a wider scope.

A lot of research has been published towards making an efficient use of spectrum in the past 10-15 years. Unfortunately, researchers and small business owners do not have the capacity to experiment their research/ideas in the field environments.

There are a few programs such as *Firstnet testlab* and *DARPA SC2's Coliseum* that partially provide such opportunity in a restricted environment and to a restricted group. If FCC could facilitate shared open playgrounds for enhancing spectrum technology and policy, it would definitely help to accelerate the pace of innovation .

[Concluding Remarks]

We have underscored the need for next-generation spectrum sharing ecosystem that would address wide range of objectives and make the dynamic spectrum sharing paradigm attractive. We request to develop an open collaborative forum to develop such a system. We recommend adopting an agile process and facilitating an open playground for experimenting innovative spectrum sharing technology and policy.

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We would be glad to discuss the vision for the next-generation spectrum sharing architecture and the suggestions in more detail.

Respectfully submitted before the Federal Communications Commission. We intend to further the comments to make corrections or additions.

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BIO

Nilesh Khambekar is President and CEO at SpectrumFi, Inc. SpectrumFi solutions bring in simplicity, precision, and efficiency to spectrum-sharing and management. SpectrumFi also collaborates with defense companies regarding development of technologies towards spectrum sharing, spectrum management, and situational awareness.

Nilesh Khambekar is an active participant of standardization bodies related to Dynamic Spectrum Sharing. Nilesh Khambekar is also a researcher and has published works related to spectrum sharing technology and policy in reputed conferences (link to the research publications).

Nilesh Khambekar received his PhD from University at Buffalo, SUNY.